PATENT SPECIFICATION 982,292

DRAWINGS ATTACHED.

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982,292

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COMPLETE SPECIFICATION.

Trip Gear for Turbines.

We, THE FAIRFIELD SHIPBUILDING & ENGINEERING COMPANY LIMITED, of Govan, Glasgow, S.W.1, a British Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a trip gear for turbines, in particular a trip gear devised for association with a turbine thrust bearing to function when the thrust bearing has suffered a predetermined amount of wear.

A turbine trip gear according to the invention includes a feeler arranged to be displaced following excessive axial displacement of the turbine shaft resulting from wear of the turbine thrust bearing, motion-multiplying means associated with the feeler, and a loaded valve adapted to be held in a normal setting by a trip element movable with the motion-multiplying means, the construction being such that displacement of the feeler is accompanied by movement and ultimate withdrawal of the trip element and by displacement of the valve to bring about stoppage of the turbine.

Conveniently, the trip gear is carried by a cover which is associated with the thrust bearing of the turbine, being secured to the turbine casing proper, the bearing including a thrust collar on the turbine shaft which collar is engaged by circumferentially spaced thrust bearing pads and is engageable with the feeler.

An example of a trip gear embodying the invention is shown in the drawings accompanying the Provisional Specification in which Fig. 1 is a vertical section of the gear and Figs. 2 and 3 are respectively, a fragmentary face view of a thrust bearing pad assembly and a fragmentary horizontal section on the line 3—3 of Fig. 2.

Referring to the drawings, 10 denotes the turbine shaft, 11 the rear end of the turbine casing and 12 a thrust bearing cover attached to the casing 11 and accommodating a thrust bearing including a thrust collar 13 on the shaft 10 engaged by a circumferentially spaced set of thrust bearing pads 14. These pads are faced with anti-friction bearing metal such as "white metal" or other soft alloy.

The trip gear includes a feeler 15, a motion-multiplying lever 16 urged by a spring-loaded presser 17, and a piston valve 18 in a chest 19 fitted to the cover 12. The piston valve 18 has a stem 20 of which the lower end is engaged normally by a trip ledge 21 in a ring 22 fixed to the lever 16. A resetting handle 23 is fitted to an upward extension 20*a* of the stem 20.

As shown, the feeler 15 is formed as an axially movable plunger disposed with its axis parallel to the shaft axis and with one end portion protruding through a space between adjacent pads 14 of the thrust bearing and with the end face 30 of said portion spaced a predetermined extent from the thrust face of the thrust collar 13, the extent being related to the permissable wear of the thrust faces of the pads. The plunger is guided for axial movement in a long boss 31 unitary with a bracket 32 attached to the thrust bearing cover 12 and fitted with a fulcrum pin 33 for the motion-multiplying lever, which has a short arm terminating in a toe 34 engaging a head 35 on the inner end of the plunger, *i.e.* the end remote from the thrust collar of the turbine shaft, said head being shouldered to abut on the bracket. The lever also has a long arm engaged at an

[*Price* 4*s.* 6*d.*]

intermediate point by the spring-loaded presser 17, which is located in the bracket, and said long arm terminates with the ring 22 formed with the internal trip ledge 21. The spring-loaded presser acts on the lever in the direction to maintain the trip ledge in engagement with the end of the piston valve stem 20. The piston valve is loaded by a spring 36 which displaces the valve when the lever is rocked to disengage the trip ledge from the valve stem, *i.e.* when the gear is tripped. After tripping, the lever is retained in tripped position by the lateral inter-engagement of the stem 20 with the ring 22; and the engineer may reset the gear by pulling the handle 23.

In the example, the space between the end face 30 of the plunger and the thrust face of the shaft collar 13 is initially of the order 0·010 inch. After pad wear to this extent, the collar engages the end face of the plunger, and after further wear to the order of 0·016 inch the displacement of the plunger is such that the gear is tripped and the turbine stopped.

In practice, the gear may be arranged to operate in association with a turbine overspeed or other governor, normally of the centrifugal type, incorporated in a pressure oil system from which release of pressure brings about closure of a stop valve of the turbine. Thus, the piston valve of the gear is interposed in the pressure oil system and so devised that, when the gear is tripped, the oil is by-passed from the system and drained into a sump within the turbine casing, such drainage continuing until the gear is manually reset.

Thus, in the example, the piston valve chest 19 at diametrically opposite sides has co-axial inlet and outlet branches 37 for the pressure oil. These branches are extensions from a diametrical hole 38 through the chest 19 into the cylindrical wall 39 in which the valve 18 is fitted the hole thus forming diametrically opposed ports in said wall. The ports are inter-connected by a semi-circular loop passage 40. Moreover, an oil drain passage 41 extends from another port 42 in the chest wall 39 to an outlet 43 where this passage opens to the turbine sump. These oil pressure and drain ports 38, 42 are normally masked by the piston valve 18. When the gear is tripped and the piston valve is displaced by its spring, the ports are unmasked, allowing the pressure oil to drain freely to the sump.

WHAT WE CLAIM IS:—

1. A turbine trip gear including a feeler arranged to be displaced following excessive axial displacement of the turbine shaft resulting from wear of the turbine thrust bearing, motion-multiplying means associated with the feeler, and a loaded valve adapted to be held in a normal setting by a trip element movable with the motion-multiplying means, the construction being such that displacement of the feeler is accompanied by movement and ultimate withdrawal of the trip element and by displacement of the valve to bring about stoppage of the turbine.

2. A turbine trip gear according to claim 1 in which the trip gear is carried by a cover which is associated with the thrust bearing of the turbine, being secured to the turbine casing proper, the bearing including a thrust collar on the turbine shaft which collar is engaged by circumferentially spaced thrust bearing pads and is engageable with the feeler.

3. A turbine trip gear according to claim 1 or 2 and arranged to operate in association with a turbine overspeed or other governor incorporated in a pressure oil system from which release of pressure brings about closure of a stop valve of the turbine.

4. A turbine trip gear according to claim 3 in which the loader valve of the gear is interposed in the pressure oil system and so devised that, when the gear is tripped, the oil is by-passed from the system.

5. A turbine trip gear substantially as described with reference to and as shown in the drawings accompanying the provisional specification.

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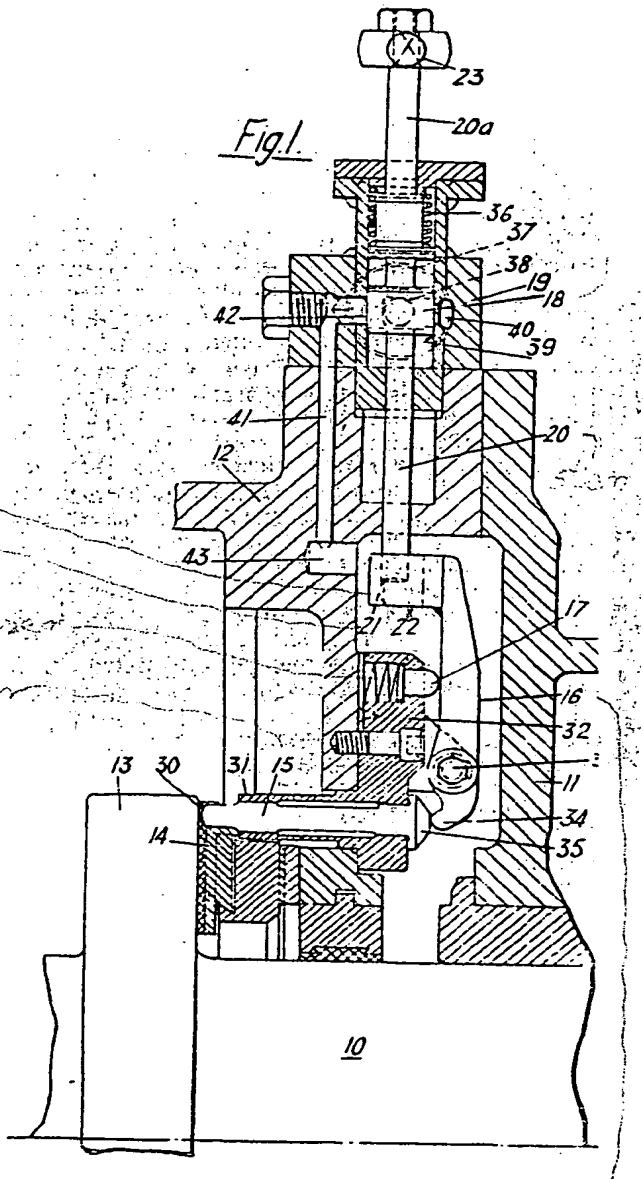
Fig.1.



wing

trip ledge

spring-loaded pressure roller

motion-multiplying lever

982292 PROVISIONAL SPECIFICATION
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheets 1 & 2

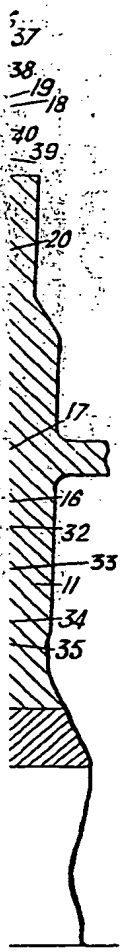


Fig. 2

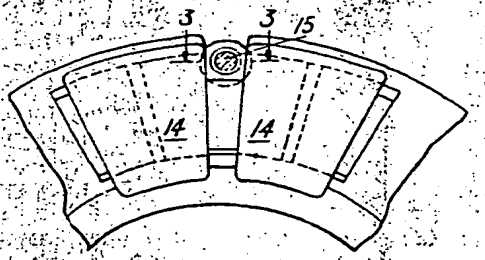


Fig. 3

982292
2 SHEETS

PROVISIONAL SPECIFICATI

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Sheets 1 & 2

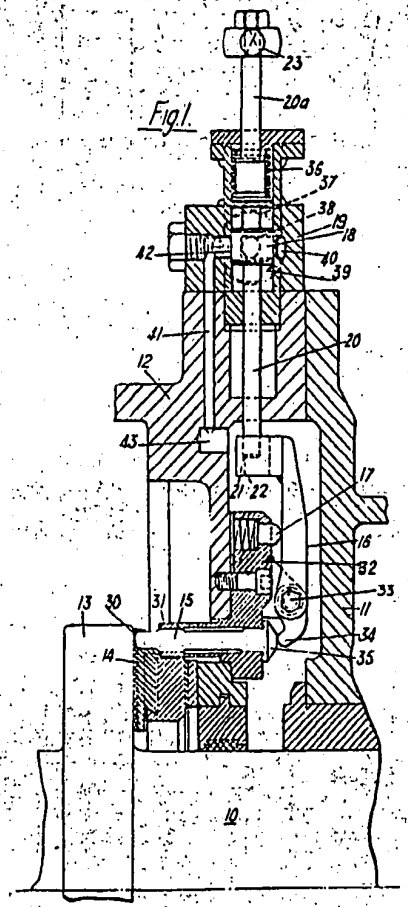

Fig.1.

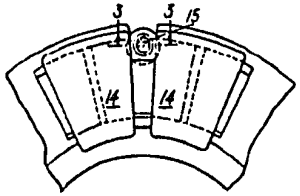

Fig.2.

Fig.3.